U.S Integrated Earth Observation System

Global Land Observation System

Preamble

The USGEO is coordinating the activities to formulate integration framework documents for the six near-term opportunity areas identified in the Strategic Plan for the U.S. Integrated Earth Observation System.

One of the steps is to take inventory of the Earth observation systems, models, and decision support systems that exist or are planned to be developed over the coming years. The following tables are initial compilations of U.S. capabilities in Earth observation systems, models and decision support systems. Earth observation systems, models, and decision support systems identified in the tables are candidates for inclusion in Integrated Earth Observation System configurations for each of the near term opportunity areas.

These tables are draft and as such, are neither exclusive nor comprehensive. We invite interested members of the community to provide input to the content of these tables and system configurations – both during the sessions on the second day of the IEOS Public Engagement Workshop and through email submissions to the USGEO. Your review and input to these tables and to the Integrated Earth Observation System configurations for each of the near term opportunities is greatly valued and appreciated.

Draft Table 1. Products, Services, Observing Systems and Models

Products/Services	Observing System/Model	Instrument	Agency
National Elevation Dataset	The USGS National Elevation Dataset (NED) has been developed by merging the highest-resolution, best quality elevation data available across the United States into a seamless raster format. NED is the result of the maturation of the USGS effort to provide 1:24,000-scale Digital Elevation Model (DEM) data for the conterminous US and 1:63,360-scale DEM data for Alaska. The dataset provides seamless coverage of the United States, HI, AK, and the island territories. NED has a consistent projection (Geographic), resolution (1 arc second), and elevation units (meters). The horizontal datum is NAD83, except for AK, which is NAD27. The vertical datum is NAVD88, except for AK, which is NAVD29. NED is a living dataset that is updated bimonthly to incorporate the "best available" DEM data. As more 1/3 arc second (10m) data covers the US, then this can also be a seamless dataset.		USGS-Surface
Elevation Derivatives for National Applications (Aspect, Contours, Filled DEM, Flow Direction, Flow Accumulation, Reach Catchment Seedpoints, Reach Catchment, Shaded Relief, Sinks, Slope, Synthetic Streamlines)	Hydrologically conditioned elevation data, systematically and consistently processed to create hydrologic derivatives, can be useful in many topologically based visualization and investigative applications. Drainage areas upstream or downstream from any location can be accurately traced facilitating flood analysis investigations, pollution studies, and hydroelectric power generation projects.		

Products/Services	Observing System/Model	Instrument	Agency
Global 90m Digital Elevation Model	The Shuttle Radar Topography Mission (SRTM) is a joint project between the National Geospatial-Intelligence Agency (NGA) and the National Aeronautics and Space Administration (NASA). The objective of this project is to produce digital topographic data for 80% of the Earth's land surface (all land areas between 60⁰ north and 56° south latitude), with data points located every 1-arc-second (approximately 30 meters) on a latitude/longitude grid. The absolute vertical accuracy of the elevation data can be 16 meters (at 90% confidence).	SRTM made use of a technique called radar interferometry. In radar interferometry, two radar images are taken from slightly different locations. Differences between these images allow for the calculation of surface elevation, or change.	
GTOPO30	GTOPO30 is a global digital elevation model (DEM) resulting from a collaborative effort led by the staff at the U.S. Geological Survey's National Center for Earth Resources Observation and Science (NCEROS) in Sioux Falls, South Dakota. Elevations in GTOPO30 are regularly spaced at 30-arc seconds (approximately 1 kilometer). GTOPO30 was developed to meet the needs of the geospatial data user community for regional and continental scale topographic data. This release represents the completion of global coverage of 30-arc second elevation data that have been available from the NCEROS beginning in 1993. Several areas have been updated and the entire global data set has been repackaged, so these data supersede the previously released continental data sets.		

Products/Services	Observing System/Model	Instrument	Agency
HYDRO1K (The HYDRO1k data sets are being developed on a continent-by-continent basis, for all landmasses of the globe with the exception of Antarctica and Greenland. The HYDRO1k package provides, for each continent, a suite of six raster and two vector data sets. These data sets cover many of the common derivative products used in hydrologic analysis. The raster data sets are the hydrologically correct DEM, derived flow directions, flow accumulations, slope, aspect, and a compound topographic (wetness) index. The derived streamlines and basins are distributed as vector data sets.)	HYDRO1k, developed at the U.S. Geological Survey's (USGS) National Center for Earth Resources Observation and Science (NCEROS), is a geographic database providing comprehensive and consistent global coverage of topographically derived data sets. Developed from the USGS' recently released 30 arc-second digital elevation model (DEM) of the world (GTOPO30), HYDRO1k provides a standard suite of geo-referenced data sets (at a resolution of 1 km) that will be of value for all users who need to organize, evaluate, or process hydrologic information on a continental scale.		

Products/Services	Observing System/Model	Instrument	Agency
			USGS-Model
Global Land Cover Characteristics Data Set (The global land cover characteristics database is developed on a continent-by-continent basis. All continents in the global database share the same map projection (Interrupted Goode Homolosine), have 1-km nominal spatial resolution, and are based on 1-km AVHRR data spanning April 1992 through March 1993. While each continental database has unique elements based on the salient geographic aspects of the specific continent, there are a common set of derived thematic maps produced through the aggregation of seasonal land cover regions. The thematic maps include: Seasonal land cover regions; Global Ecosystems (Olson, 1994a, 1994b); International Geosphere Biosphere Programme Land Cover Classification (Belward, 1996); USGS Land Use/Land Cover System (Anderson and others, 1976); Simple Biosphere Model (Sellers and others, 1986); Simple Biosphere 2 Model (Sellers and others, 1996); Biosphere-Atmosphere Transfer Scheme (Dickinson and others, 1986).	The data set is derived from 1-km Advanced Very High Resolution Radiometer (AVHRR) data spanning a 12-month period (April 1992-March 1993) and is based on a flexible database structure and seasonal land cover regions concepts. Seasonal land cover regions provide a framework for presenting the temporal and spatial patterns of vegetation in the database. The regions are composed of relatively homogeneous land cover associations (for example, similar floristic and physiognomic characteristics), which exhibit distinctive phenology (that is, onset, peak, and seasonal duration of greenness), and have common levels of primary production. Rather than being based on precisely defined mapping units in a predefined land cover classification scheme, the seasonal land cover regions serve as summary units for both descriptive and quantitative attributes. The attributes may be considered as spreadsheets of region characteristics and permit updating, calculating, or transforming the entries into new parameters or classes. This provides the flexibility for using the land cover characteristics database in a variety of models without extensive modification of model inputs. The analytical strategy for global land cover characterization has evolved from methods initially tested during the development of a prototype 1-km land cover characteristics database for the conterminous United States (Loveland and others, 1991, 1995; Brown and others, 1993). In the U.S. study, multitemporal AVHRR data, combined with other ancillary data sets, were used to produce a prototype land cover characteristics		

Products/Services	Observing System/Model	Instrument	Agency
National Land Cover Dataset 1992			
National Land Cover Dataset 2001			
Multi-resolution Land Characteristics 1992 Imagery			USGS-Spaceborne
Multi-resolution Land Characteristics 2001 Imagery			
			DOI-Surface
			NOAA-Surface
			NOAA-Model
			NOAA/NASA-Model
			NOAA-Spaceborne
			USDA-Surface
			USDA-Model
Land Surface Reflectance	Terra	ASTER	NASA-Spaceborne
Land Brightness Temperature	Terra	ASTER	
Land Surface Emissivity	Terra	ASTER	
Land Surface Radiance	Terra	ASTER	
Digital Elevation Model	Terra	ASTER	
Land Surface Reflectance	Terra/Aqua	MODIS	
Land Surface Temperature/Emissivity	Terra/Aqua	MODIS	
Land Cover	Terra	MODIS	
Vegetative Indices	Terra/Aqua	MODIS	
Thermal Anomalies/Fire	Terra/Aqua	MODIS	
LAI/FPAR	Terra/Aqua	MODIS	
BRDF/Albedo	Terra	MODIS	
			NASA-Model
			NASA-Surface
			DOE-Surface
			EPA-Surface
			EPA-Models
			Any other Contributing Agency -Surface
			Any other Contributing Agency-Model
			Any other

Products/Services	Observing System/Model	Instrument	Agency
			Contributing Agency-Spaceborne
			Commercial

Draft Table 2. Decision Support Systems

Decision Support Tool	Description	Contributing Agencies
To be included		

Acronym List

A

ACCA	Automatic Cloud Cover Assessment
ADEOS	Advanced Earth Observation Satellite
AGS	Alaska Ground Station
AIRMoN	Atmospheric Integrated Research and Monitoring Network
ALOS	Advanced Land Observing Satellite
AMSR	Advanced Microwave Scanning Radiometer (satellite)
AMSU	Advanced Microwave Sounding Unit (satellite)
ANSS	Advanced National Seismic System
AQI	Air Quality Index
ASAR	Advanced Synthetic Aperture Radar (on Envisat)
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
ATBD	Algorithm Theoretical Basis Document
AU	Astronomical Unit
AVHRR	Advanced Very High Resolution Radiometer
AVIRIS	Airborne Visible-Infrared Imaging Spectrometer

B

BRDF	Bidirectional Reflectance Distribution Function

C

CCD	Charge Coupled Device
CCSDS	Consultative Committee for Space Data Systems
CCSP	Climate Change Science Plan
CENR	Committee on Environment and Natural Resources
CEOS	Committee on Earth Observation Satellites
CMAQ	Community Multi-scale Air Quality model
COSPEC	Correlation Spectrometer (to detect SO2)
CPF	Calibration Parameter File
CRAM	Combined Radiometric Correction Model

D

DART	Deep-ocean Assessment and Reporting of Tsunami
DEM	Digital Elevation Model
DFCB	Data Format Control Book
DHS	Department of Homeland Security
DIS	Data and Information System'
DMSP	Defense Meteorological Satellite Program
DoD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior
DOQ	Digital Orthophoto Quadrangle
DOT	Department of Transportation
DRM	Data Reference Model

E
ECS   EOSDIS Core System
ECV   Essential Climate Variables
EDM   Electronic Distance Measurement
EOS   Earth Observing System; Earth Observing Subcommittee
EOSAT Earth Observation Satellite Company
EOSDIS EOS Data and Information System
EPA   Environmental Protection Agency
EPGS   EOS Polar Ground Sites
EROS   Earth Resources Observation and Science
ERS   European Remote Sensing
ESA   European Space Agency
ET   Evapotranspiration
ETM   Enhanced Thematic Mapper (Landsat instrument)
ETM+   Enhanced Thematic Mapper Plus (Landsat instrument)
EVI   Enhanced Vegetation Index

F
FAC   Full Aperture Calibrator
FDF   Flight Dynamics Facility
FEAF   Federal Enterprise Architecture Framework
FGDC   Federal Geographic Data Committee
FOV   Field of View
FPAR   Fraction of Photosynthetically Active Radiation
FTP   File Transfer Protocol

G
GAW   Global Atmospheric Watch
GCM   General Circulation Model
GCOS   Global Climate Observing System
GEOSS Global Earth Observation System of Systems
GEOSAT Geodetic Satellite
GeoTIFF Geographic Tagged Image File Format
GLOS   Global Land Observation System
GOES   Geostationary Operational Environmental Satellite
GOOS   Global Ocean Observing System
GPS   Global Positioning System
GSD   Ground Sample Distance
GSN   GCOS Surface Network
GTOS   Global Terrestrial Observing System
GUAN   GCOS Upper Air Network

H
HAZUS Hazards U.S. (FEMA's Hazard and Risk Assessment software package)
HHS   Health and Human Services

I

IAS	Image Assessment System
IEOS	Integrated Earth Observation System
IFOV	Instantaneous Field of View
IGBP	International Geosphere-Biosphere Programme
IGCO	Integrated Global Carbon Observation
IGOS	Integrated Global Observation System
IGS	International Ground Stations
InSAR	Interferometric Synthetic Aperture Radar
IOC	Initial On-orbit Checkout
IPCC	Intergovernmental Panel on Climate Change
IR	Infrared
IWGEO	Interagency Working Group on Earth Observations

J

JPL	Jet Propulsion Laboratory

L

LAHARZ	Lahar Zonation (lahar run-out model)
LAI	Leaf Area Index
LGS	Landsat Ground Station
LICOR	small infrared analyser for CO2 (brand name)
LIDAR	Light Detection and Ranging
LP DAAC	Land Processes Distributed Active Archive Center
LTAP	Long Term Acquisition Plan
LULCC	Land Use and Land Cover Change

M

MASTER	airborne ASTER sensor
ME	Memory Effect
MEASURE	Mobile Emissions Assessment System for Urban and Regional Evaluation
METEOSAT	Meteorology Satellite
MISR	Multi-angel Imaging Spectroradiometer
MMS	Multi-mission Modular Spacecraft
MOC	Mission Operations Center
MODIS	Moderate Resolution Imaging Spectroradiometer
MRLC	Multi-Resolution Land Characteristics
MSCD	Mirror Scan Correction Data
MSS	Multispectral Scanner
MTF	Modulation Transfer Function

N

NALC	North American Landscape Characterization pathfinder project with land cover
NASA	National Aeronautics and Space Administration
NCEP	National Centers for Environmental Prediction
NDVI	Normalized Difference Vegetation Index
NED	National Elevation Dataset
NEIC	National Earthquake Information Center
NGA	National Geospatial-Intelligence Agency
NHD	National Hydrography Dataset
NIR `	Near Infrared
NISN	NASA Integrated Services Network
NOAA	National Oceanic and Atmospheric Administration
NPOESS	National Polar-orbiting Operational Environmental Satellite System
NSF	National Science Foundation
NTO	Near-Term Opportunities
NVEWS	National Volcano Emergency Warning System

O

OMI	Ozone Monitoring Instrument
OP-FTIR	Open-path Fourier Transform Infrared sensor
OSTP	Office of Science and Technology Policy

P

PAC	Partial Solar Calibrator
PAGER	Preliminary Assessment for Global Earthquake Response
PALSAR	Phased Array L-band Synthetic Aperture Radar
PBO	Plate Boundary Observatory (component of Earthscope)
PM	Particulate matter, in sizes less than the number of um stated, e.g., PM2.5
POES	Polar-orbiting Operational Environmental Satellites

Q

QA	Quality Assurance

R

RADM	Regional Acid Deposition Model
RAQMS	Regional Air Quality Modeling System

S

SAR	Synthetic Aperture Radar
SCIGN	Southern California Integrated GPS Network
SCS	Scan Correlated Shift
SGS	Svalbard Ground Station
SLC	Scan Line Corrector
SMA	Scan Mirror Assembly
SME	Scan Mirror Electronics
SMOKE	Sparse Matrix Operator Kernel Emissions Modeling System

SNR	Signal to Noise Ratio
SRR	Solid State Recorder
SRTM	Shuttle Radar Topography Mission
SURFRAD	Surface radiation budget network
SWIR	Short Wave Infrared

T

TDRS	Tracking Data and Relay Satellites
TIMS	Thermal Infrared Multispectral Scanner
TM	Thematic Mapper (Landsat instrument)
TOA	Top-of-Atmosphere
TOMS	Total Ozone Mapping Spectrometer
TRMM/PR	Tropical Rainfall Measuring Mission/Precipitation Radar

U

UAV	Uninhabited Aerial Vehicles
UNESCO	United Nations Educational, Scientific, and Cultural Organization
USAF	United State Air Force
USDA	United States Department of Agriculture
USGEO	U.S. Group Earth Observations
USGS	United States Geological Survey

V

VAFTAD	Volcanic Ash Forecast Transport and Dispersion model
VIIRS	Visible Infrared Imager/Radiometer Suite
VNIR	Visible & Near Infrared

W

WFF	Wallops Flight Facility
WGS	World Geodetic System
WMO	World Meteorological Organization
WRS	Worldwide Reference System